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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,300	10/09/2003	Mong Suan Yee	243735US2CRL	7988
22850 7590 04/06/2007 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER PANWALKAR, VINEETA S	
			ART UNIT	PAPER NUMBER
			2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/06/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/06/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/681,300

Applicant(s)

YEE

Examiner

Vineeta S. Panwalkar

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 1-10, 16-26, 35-38 and 42-46 is/are allowed.
- 6) ☒ Claim(s) 11-15, 27 and 39-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>4/14/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because it contains more than 150 words. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 11, 12, 14, 15, 27, 39, 40, 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmori et al. (US 2002/0110188 A1), hereinafter, Ohmori, in view of Abe et al. (IEEE 54th Vehicular Technology Conference Proceedings, vol. 2 of 4, pages 1230-1234, "Space-Time turbo equalization and symbol detection in frequency selective MIMO channels", October 7, 2001), hereinafter, Abe.
- 2a. Regarding claims 11, 12, 14, 15, 27, 39, 40, 41 and 42, Ohmorishows adaptive equalization in a receiver (See Figs. 3, 4 and 7) wherein is disclosed a method of turbo-equalising (Paragraphs [0001], [0002]) data in

a receiver receiving data from a transmitter configured to transmit data from a plurality of transmit antennas simultaneously (Paragraphs [003] – [0009]), the receiver including a SISO decoder (Abstract, paragraph [0004]), the method comprising:

- inputting a received signal vector comprising a block of received signal data including data received from said plurality of transmit antennas (Paragraph [0009]);
- receiving soft decoded information from said decoder (see Abstract, paragraph [0004]);
- processing said received data using a linear filter having a plurality of soft inputs derived from said received signal vector to provide a plurality of soft equaliser outputs, one for each transmit antenna, to said SISO decoder (Paragraphs [0029] – [0034]); and
- adjusting coefficients of said linear filter in response to said soft decoded information (Paragraph [0032]. Calculation of tap coefficients is interpreted as claimed adjusting) to mitigate ISI (Paragraph [0031]. The reduction of intersymbol interference is interpreted as claimed mitigation of ISI).

Regarding claims 11 and 15, Ohmori also shows claimed transversal filter (Paragraphs [0057] – [0060]).

Regarding claim 14, Ohmori further shows the filter to operate in time domain (Paragraphs [0007] and [0008]) wherein the coefficients comprise

coefficients which are substantially time invariant over a symbol packet comprising a plurality of received symbols. Time invariance means that whether we apply an input to the system now or T seconds from now, the output will be identical, except for a time delay of the T seconds. In paragraphs [007], Ohmori shows how sampled received signals are applied to a cascade-connection of delay elements T to obtain signals delayed by T -sec intervals in a sequential order. Thus, the system is time invariant).

Regarding claim 40, Ohmori also shows carrier carrying the processor control code of claim 39. (See paragraph [0073] shows that since computer simulations are shown, a processor is inherent. Thus, a control code and a signal that relays the control code (claimed carrier) is also inherent).

Thus, Ohmori shows all the limitations claimed, but fails to explicitly show whether the equalization results in mitigation of multi-stream interference (MSI).

However, in the same field of endeavor, Abe shows how a SISO equalizer may be used to reduce not only ISI, but also multiple access interference (interpreted as claimed MSI) (See Abstract).

Regarding claim 12, Abe shows the use of MMSE criterion in a transversal filter in a SISO MIMO turbo equalizer (Page 1232).

Thus, it would have been obvious to a person of ordinary skill in the art that using SISO equalizer reduces additive noise induced by the channel.

3. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmori in view of Abe as applied to claim 11 above, and further in view of Berthet et al. (US 6993070 B1), hereinafter, Berthet.

3a. Regarding claim 13. Ohmori and Abe disclose all the limitations claimed (See 2a above), but fail to explicitly mention the use of Fourier transform and inverse Fourier transform.

In the same field of endeavor, however, Berthet shows a Method and system of iteratively detecting and decoding received symbols coupled with re-estimation of the coefficients of the transmission channel using SISO equalizer and decoder (See Figs. 3a-3d) wherein Fourier transform is used to calculate coefficients of minimum phase filter and the anticausal filter (See Fig. 3c. The anti causal filter precedes the equalizer). Similarly, an inverse procedure is performed following the decoder in block 43.

Thus, it would have been obvious to use Berthet's method because it largely improves equalizer performance (Column 2, line 57- column 3, line 17).

Allowable Subject Matter

4. Claims 1-10, 16-26, 35-38 and 43-46 are allowed.

The following is an examiner's statement of reasons for allowance:

- 4a. Regarding claims 1, 10, 16, 26, 35, 37 and 38, prior art of record fails to show a SISO equalizer comprising processor configured to determine from said plurality of signal likelihood values an estimated mean and covariance value for a signal from each of said transmit antennas; an expected signal determiner coupled to said processor to determine an expected received signal value using said mean values; a subtractor coupled to said received signal input to subtract said expected received signal value from said received signal to provide a compensated signal; a filter coupled to said subtractor to filter said compensated signal to provide a plurality of estimated transmitted signal values, one for each said transmit antenna; a filter coefficient determiner coupled to said processor to determine coefficients of said filter using said covariance values (and corresponding method for 16, 26, 35, 37 and 38), in combination with each and every other limitation of the claims.
- 4b. Claims 2-9, 17-25 and 36 are allowed as being dependent on claims 1, 16 and 35.

- 4c. Regarding claims 28, 43, 45 and 46 prior art of record fails to show a SISO equalizer comprising determining the updated estimated transmitted signal exactly as claimed, in combination with each and every other limitation of the claims.
- 4d. Claims 29-34 and 44 are allowed as being dependent on claims 28 and 43.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:
- Becker et al. (US 2002/0110206 A1) show combined interference cancellation in system employing SISO decoder.
 - Gamal et al. (US 6671338 B1) show combined interference cancellation in system employing SISO decoder.
 - Singer et al. (US 7016440 B1),

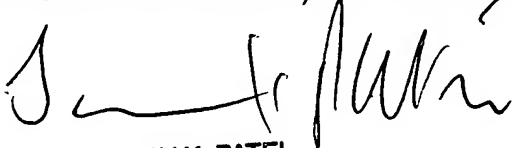
Contact Information

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vineeta S. Panwalkar whose telephone number is 571-272-8561. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

VP


JAY K. PATEL
SUPERVISORY PATENT EXAMINER